CLAIMS

1. An electrostatically-actuated shutter for use with a fuel cell system, comprising:

(A) a first electrode held at a first voltage said first electrode having at least one opening therein;

(B) a second electrode held at a second voltage, that is different than said first voltage, and said second electrode having at least one opening therein;

(C) a diaphragm disposed between said first electrode and said second electrode, said diaphragm having openings therein that correspond with the openings in said second electrode, and which do not correspond with the openings in said first electrode;

(D) a driver coupled to said diaphragm that adjusts the voltage of said diaphragm such that when the driver sets a voltage for said diaphragm, the diaphragm is attracted to the fixed electrode having a different voltage, and when said diaphragm is drawn to said second electrode, its openings align with the openings of said second electrode to create aperatures through which gases and vapors can flow; and

(E) an exit port through which gases and vapors are delivered from said shutter.

2. A fuel cell system with an electrostatically-actuated shutter assembly for use with a comprising:

(A) planar array of direct oxidation fuel cells;

(B) a plurality of electrostatically actuated shutter components disposed in a planar configuration and located contiguous to said planar array of fuel cells, each shutter components having:

(i) a first electrode held at a first voltage said first electrode having at least one opening therein ;

(ii) a second electrode held at a second voltage, that is opposite to said first voltage, and said second electrode having at least one opening therein;

(iii) a diaphragm disposed between said first electrode and said second electrode, said diaphragm having openings therein that correspond with the openings in said second electrode, and which do not correspond with the openings in said first electrode;

(iv) a driver coupled to said diaphragm that adjusts the voltage of said diaphragm such that when the driver sets a voltage for said diaphragm, the diaphragm is attracted to the fixed electrode having a different voltage, and when said diaphragm is drawn to said second electrode, its openings align with the openings of said second electrode to create apertures through which gases and vapors can flow; and

(v) an exit port through which gases and vapors are delivered from said shutter.

3. A method of controlling the delivery of fuel to a fuel cell system having an associated source of vaporous fuel, and a fuel cell having an anode aspect and a cathode aspect, the method including the steps of:

(A) providing an electrostatically-actuating shutter contiguous to said fuel source such that said shutter in an open position, allows fuel to flow to said anode aspect of said fuel cell, and in a closed position stops the delivery of fuel to said fuel cell; and

(B) driving said shutter such that at a first voltage, an internally disposed diaphragm in said shutter, is electrostatically attracted to a fixed electrode surface that seals said fuel cell against flow of fuel into or out of said fuel cell, and at a second voltage, the diaphragm is attracted to a fixed electrode surface that allows the flow of fuel through the shutter.

4. The method of delivering fuel as defined in claim 3 including the further step of driving said diaphragm to said first and second voltages periodically using a pulse width modulation technique.

5. The method of delivering fuel as defined in claim 3 including the further step of driving said diaphragm to said first and second voltages periodically using a pulse frequency modulation technique.